

## REMARKS

### 1. Summary of the Office Action

In the office action mailed August 13, 2008, the Examiner objected to Figures 1, 2, and 6. The Examiner also rejected claims 1-16 under 35 U.S.C. §102, first paragraph, as failing to comply with the written description requirement, rejected claims 1, 4, 5, 8, and 9 under 35 U.S.C. §103(a) as being unpatentable over Suzuki et al (U.S. Application Publication 2002/0126346) in view of Hatami-Hanza et al (Hatami-Hanza et al, "Demonstration of All-Optical Demultiplexing of a Multilevel Soliton Signal Employing Soliton Decomposition and Self-Frequency Shift," IEEE Photonics Technology Letters, Vol. 9, No. 6, July 1997, pages 833-835) and Sugawara (U.S. Application Publication 2003/0058500), rejected claim 7 under 35 U.S.C. §103(a) as being unpatentable over Suzuki and Hatami-Hanza and Sugawara and further in view of Horiuchi et al (U.S. Patent 5,726,789), rejected claims 2, 3, 10-13, and 15 under 35 U.S.C. §103(a) as being unpatentable over Suzuki in view of Hatami-Hanza and Horiuchi, rejected claim 16 under 35 U.S.C. §103(a) as being unpatentable over Suzuki and Hatami-Hanza and Horiuchi and further in view of Sugawara, and rejected claims 6 and 14 under 35 U.S.C. §103(a) as being unpatentable over Suzuki and Hatami-Hanza and Sugawara and Horiuchi and further in view of Islam et al (Islam et al, "Soliton Trapping in Birefringent Optical Fibers," Optics Letters, September 15, 1989, pages 1011-1013).

### 2. Status of the Claims

Applicant has herein amended claims 1-16. Currently pending are claims 1-16, of which claims 1, 2, 9, and 10 are independent and the remaining pending claims are dependent. No new matter is added.

### 3. Response to the Objections to Figures 1, 2, and 6

As noted above, the Examiner objected to Figures 1, 2, and 6. Applicant herein provides replacement sheets in this response to change " $(\lambda_1, I_s)(t_1, t_2, t_3, t_4)$ " to " $(\lambda_4, I_s)(t_1, t_2, t_3, t_4)$ " in Figure 1 and to change "t" to "F" in the label of the horizontal axis in the bottom panel of the third column of Figure 6. Please replace the sheet 1/4 including Figures 1 and 2 as filed on May 24, 2003 with

the attached replacement sheet 1/4 in this response and replace the sheet 4/4 including Figure 6 as filed on May 24, 2003 with the attached replacement sheet 4/4 in this response.

With respect to Figure 2, the Examiner asserted that “each pulse of the individual wavelength signal occupy 100 ps time slot before the multiplexer 120, but, after the multiplexer, the pulses occupy 25 ps time slot. According to the disclosure, the delay lines and the attenuators do not compress the pulse. The pulses of each wavelength should occupy 25 ps time slot also before the multiplexer 120.” See the Final Office Action, page 6, lines 4-8.

Applicant has herein amended specification, paragraph [0055] to recite “As shown in FIG. 2, each 100 ps pulse is compressed so that at the output of the multiplexer, the pulses are only 25 ps such that the four output pulses have total temporal width of 100 ps.” The support for this amendment can be found in Figure 2 as filed on May 24, 2003. It is clearly shown there that each input pulse has a width of 100 ps and each output pulse is compressed to a width of 25 ps. Since the amended description is clearly shown in Figure 2 as originally filed, Applicant submits that no new matter has been added and requests the Examiner withdraw the objection to Figure 2.

#### **4. Response to the Rejections under U.S.C. §112, first paragraph**

As noted above, the Examiner rejected claims 1-16 under U.S.C. §112, first paragraph, as failing to comply with the written description requirement. The Examiner pointed to claims 1, 2, 9 and 10 and asserted that “The original disclosure does not describe a birefringent propagation medium into which the WDM signals having the pulses which are simultaneous and carried at the different wavelengths are injected to achieve soliton trapping.” See the Final Office Action, page 7, line 21 to page 8, line 2. Without conceding the Examiner’s assertion, Applicant has amended claims 1, 2, 9, and 10 to remove the feature of “into which the WDM signals having the pulses which are simultaneous and carries at the different wavelengths are injected to achieve a soliton trapping.” Applicant therefore respectfully submits that that the amendments render the rejections moot and requests the Examiner withdraw the rejections.

## **5. Response to the Rejections under U.S.C. §103(a).**

As noted above, the Examiner rejected independent claims 1 and 9 under U.S.C. §103(a) as being obvious over Suzuki in view of Hatami-Hanza and Sugawara and rejected independent claims 2 and 10 under U.S.C. §103(a) as being obvious over Suzuki in view of Hatami-Hanza and Horiuchi. Applicant disagrees with the Examiner, but has nonetheless amended these claims to expedite the prosecution.

M.P.E.P. §2142 recites:

In view of all factual information, the examiner must then make a determination whether the claimed invention “as a whole” would have been obvious at that time to that person. Knowledge of applicant’s disclosure must be put aside in reaching this determination...impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

In rejecting claim 1, the Examiner asserted that Suzuki teaches all the limitations of claim 1 except “(A) modulation means adapted to modify the optical power of the WDM signals, (B) a birefringent propagation medium (13) into which the WDM signals having the pulses which are simultaneous and carried at the different wavelengths are injected to achieve a soliton trapping, and (C) absorption means configured to introduce optical losses into the components of the OTDM signal.” See the Final Office Action, page 10, line 18 to page 11, line 2. The Examiner then asserted that Hatami-Hanza provides teaching of the features of (A) and (B) since Figure 1 of Hatami-Hanza describes the attenuator Att. 1 to Att. 4 and the “Fiber Spans” having the property of soliton self-frequency shifting. See Final Office Action, page 11, lines 4-11. The Examiner also asserted that Sugawara discloses the feature of (C) as Sugawara teaches “a system and method (Figures 7 and 8) in which the optical pulses are reshaped so that each pulse has substantially same power.” See Final Office Action, page 12, lines 8-11. On the basis on these assertions, the Examiner then concluded that the combination of Suzuki, Hatami-Hanza, and Sugawara teaches the subject matter as set forth in claim 1.

Applicant respectfully disagrees with the Examiner’s assertion. Amended claim 1 now recites an optical device for converting one or more wavelength division multiplexed (WDM) signals to an optical time division multiplexed (OTDM) signal, including “a time-shifting means”, “a

modulation means”, “a multiplexing means”, “a birefringent propagation medium”, and “an absorption means”.

In rejecting claim 1, the Examiner erred in making an unacceptable amount of alterations to the cited prior art by relying on impermissible hindsight gleaned from Applicant’ disclosure. For example, the Examiner has admitted that Suzuki lacks the teachings of “a modulation means” and “a birefringent propagation medium” as set forth in claim 1. The Examiner then relied on Hatami-Hanza in an effort to show that these claimed features would have been obvious and used Hatami-Hanza to modify the Suzuki. However, a review of the Hatami-Hanza reference shows that Hatami-Hanza merely describes a technique to simplify the optical receiver design. That is, by using a “self-frequency shifting” property of optical pulses, an amplitude shift keying time division (ASK TDM) signal “can simply be demultiplexed employing an optical filter bank.” See Hatami-Hanza, page 833, second column, first paragraph, lines 6-12, and page 835, second column, second paragraph, lines 1-6. Specifically, the system of Hatami-Hanza relies on the frequency shift imposed by the communications channel between the transmitter and the receiver. A further review of Hatami-Hanza shows that that in order to achieve separations of the signal components and suppress crosstalk of the received signal, the optical fiber spans used to transmit the multiplexed signal has to have a length of at least 34.5 km. See Hatami-Hanza, page 834, second column, second paragraph, lines 1-26. In the office action, the Examiner appears to suggest that the 34.5 km long fiber spans can be used in the place of the “birefringent propagation medium” in claim 1. Since Hatami-Hanza merely describes a 34.5 km long optical fiber communications channel between a transmitter and a receiver to shift the transmit frequency, one skilled in the art would not look to Hatami-Hanza in order to generate an OTDM signal for transmission, nor would find teaching there or else where to use such 34.5 km long optical fiber in “an optical device” as set forth in claim 1.

Secondly, even if Suzuki, Hatami-Hanza, and Sugawara were combined, the combination thereof still fails to teach or suggest the subject matter set forth in claim 1. The Hatam-Hanza reference merely suggests transmitting a time division signal through an optical fiber such that the

signal may be demultiplexed at the receiving end by a simple optical filter bank. See Hatami-Hanza, Figure 2 and page 835, first column, paragraph 1, lines 1-7. As described in the Hatami-Hanza reference, it is clear that the signal components received at the receiving end of the system not only spread over multiple time slots (i.e. time division) but also spread over multiple frequency bands (i.e. frequency division due to the soliton self-frequency shift). Such a method and system for transmitting information appear to be highly inefficient since three quarters of the system resources, if not worse, would be wasted. Hence, combining Hatami-Hanza with Suzuki will result in an extremely inefficient communication system. The subject matter of claim 1, on the contrary, sets forth an efficient method for transmitting signals by converting one or more WDM signal components into an OTDM signal for subsequent transmission. Also see specification, Figure 3. The signal components in the resulting OTDM signal as recited in claim 1 only occupy a single frequency band after the soliton trapping provided by the birefringent propagation medium, and therefore no system resource is wasted when the resulting signal is used for subsequent transmissions.

Finally, the Examiner had to significantly alter the prior art Hatami-Hanza and then combined the altered version of the Hatami-Hanza reference with the Suzuki reference. Specifically, in the Final Office Action, the Examiner further provided a diagram in the bottom panel of Figure O1 and asserted that it would be obvious to one skilled in the art to combine Suzuki and Hatami-Hanza to come to a system as shown in the diagram. In order to come to a system shown in Figure O1 in the Final Office Action, the Examiner took apart the system in Hatami-Hanza and reversed the signal direction described therein. It was inappropriate for the Examiner to reengineer the prior art to provide a signal conversion that is opposite to what was intended in Hatami-Hanza in order to meet the WDM-to-OTDM conversion as set forth in claim 1.

With respect to the Sugawara reference, it fails to make up the deficiencies of Suzuki and Hatami-Hanza as set forth in the above discussion. In particular, the Examiner has not asserted that the Sugawara discloses or suggests “a birefringent propagation medium” as set forth in claim 1. Because independent claim 1 as a whole patentably distinguishes from the cited art as set

forth in the Final Office Action, Applicant herein respectfully submits that the subject matter recited as a whole in claim 1 is not obvious over the cited art and therefore requests the Examiner withdraw the rejection.

With respect to independent claim 9, Applicant respectfully points out that it recited similar limitations of claim 1 and is not obvious over the combination of Suzuki, Hatami-Hanza, and Sugawara for at least the reasons set forth above. Applicant therefore submits that the subject matter recited as a whole in claim 9 patentably distinguishes over the cited art and requests the Examiner withdraw the rejection of claim 9.

With respect to independent claims 2 and 10, they stand rejected as being obvious over Suzuki in view of Hatami-Hanza and Horiuchi. Applicant respectfully disagrees with the Examiner. Firstly, the Examiner has erred in concluding, for the reasons set forth above, that the combination of Suzuki and Hatami-Hanza provides “an optical device” having “a birefringent propagation medium” as set forth in claims 2 and 10. Secondly, the Horiuchi reference fails to make up this deficiency. In particular, the Examiner has not asserted that Horiuchi discloses or suggests the claimed feature of “a birefringent propagation medium” of claims 2 and 10, nor has the Examiner provided any reasonable basis to modify Horiuchi to provide this claimed feature. Applicant therefore submits that the subject matter recited as a whole in claims 2 and 10 patentably distinguishes over the cited art and requests the Examiner withdraw the rejections.

With respect to pendent dependent claims 3-8 and 11-16, without conceding the Examiner's assertions, Applicant respectfully submits that these claims are dependent from the independent claims 1, 2, 9, and 10 and therefore patentably distinguish over the cited prior art.

## 7. Conclusion

Applicant submits that the pending claims 1-16 are in good and proper form and respectfully requests favorable reconsideration and allowance of all of the pending claims. Should the Examiner wish to discuss this case with the undersigned, the Examiner is invited to call the undersigned at (312) 913-3305.

Respectfully submitted,

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Date: October 14, 2008

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